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COCAINE ANALGESIA; ITS EXTENDED APPLICATION IN GENERAL SURGERY, WHEN HYPODERMICALLY EMPLOYED.

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SINCE Dr. Karl Koller first demonstrated to the medical world, the therapeutic properties of cocaine, experimenters and physiologists have been occupied in endeavoring to discover the *modus operandi* of the drug. I find in scanning the latest literature on the subject, that authors proclaim the most discordant views, with reference to its physiological action, when administered internally or hypodermically.

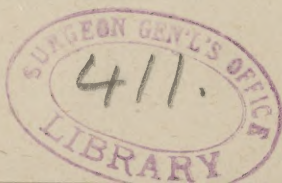
One¹ says that it locally paralyzes the sensory nerves; another,² that the paralysis or loss of sensation is secondary to an impression on the vaso-motor nerves, which, by their inhibitory action, cause stagnation in the blood-vessels interfering with the nutrition and sensibility of the sensory nerve-filaments; while Paul Bert³ asserts, that the drug, when used hypodermically, its effects only extend as far as the tissues in which it comes directly in contact. According to Von Ploss,⁴ in order to cause death, enormous doses of the alkaloid would be required. As an instance, in confirmation of this assertion, he cites the case of a druggist who took twenty-two grains with suicidal intent. Shortly after swallowing the dose he went to sleep, but shortly awoke, with a violent headache; which, however, in a

¹ Wood's Therapeutics, vol i, p. 217.

² Lauder Brunton: Therapeutics.

³ Wood's Handbook of the Medical Sciences, vol. vii, p. 200.

⁴ Die Pflanzen Stoffe, p. 107.



few hours passed away, and he felt no inconvenience whatever.

On the present occasion I am concerned only with the local action of the analgesic, when injected into the tissues in solutions of various strength; and, strange to say, I can find no American nor English contributor, who has written any systematic or extended articles on the uses of cocaine when injected into the tissues. This would seem to indicate, that as yet, very many regard the propriety of administering it hypodermically, in surgical operations, as of doubtful expediency, if even permissible, at all. This must arise either from an unreasonable prejudice, want of observation in its application, or an unpleasant experience with its administration.

All admit its wonderful power in the surgery of the eye and the nose and throat; in fact, in any part lined by mucous membrane; but, when we come to the great serous cavities; the muscular, vascular and cellular tissues, there is a portentous silence, which would seem to imply, that here, *at least*, it can serve no useful purpose.

I am convinced after an extended observation, that this alkaloid ranks second to none, in safety and in general application; except in those surgical cases in which considerable time is consumed in operating. With my first trial of it, I was disappointed and disgusted, so that for more than three years after I wholly abandoned its use, and listened with incredulity when I heard any one speak of its value, as an analgesic, in hypodermic dosage.

The first case I tried it on was in Ninety-ninth Street Hospital, in the winter of 1886. My patient had had his leg so crushed, by a railroad accident, that I had to amputate close to the knee joint. In my desire to economize tissue, I found when the integuments closed

over the stump, that there was scarcely enough to provide proper protection to it; hence, I decided to resect the exposed end of the tibia and spread the flaps over it.

As my patient was loath to take ether again, I advised the hypodermic administration of cocaine; which, I assured him, would so benumb sensation that no suffering would be felt. He groaned terribly when the hypodermic needle was introduced, so that it required three assistants to hold him. At last having emptied three syringefuls (thirty drops in each) of a four-percent. solution, or nearly four grains, I took up the scalpel and made a free, oval incision along the outline of the stump, thereby dividing several of the surface veins, which were gorged with blood by the pressure of the elastic-band. He now became utterly unmanageable, and for a time his screams could be heard over considerable distance; and, to add to our dismay, he reeled over in a faint; became nearly pulseless, cold and deathly pale. After perhaps, twenty minutes, reaction set in, and in a short time, he was feeling better again. We postponed further operations till the next day, when under ether, we completed our resection of the stump. I need hardly say, that with this experience my enthusiasm for cocaine had faded out, and I felt earnestly thankful that a life was not lost through our experiment; for, I was thoroughly frightened.

It was not until last May, after having read the classical *brochure* of the distinguished French surgeon, Paul Réclus,⁵ on cocaine, that I again resorted to it in surgical operations.

Réclus's article throws a flood of light on the question. He reports seven hundred operations performed with the hypodermic injection of cocaine; among them colotomy (iliac), gastrotomy, nephrotomy, operation

⁵ Cocaine-Anæsthesia; Le Mécridi Medicale, Mai 12, 1890.

for typhilitis, lithotomy, perineal and suprapubic urethrotomy; for fistula in ano; cholecystotomy; for necrosis, minor amputations, hernia, reducible and strangulated; besides, plastic operations, and many others of a minor character. He claims to have made a searching examination into the literature of the subject and can learn from German, English and French sources, of but one death, which could be clearly attributed to the lethal action of the alkaloid.

He attaches great importance to the quality and freshness of the drug; and claims that many accidents, immediate and remote, are attributable to the adulterated article, or else to stale, septic solutions. His most marvellous successes have been in anthrotomies, in tubercular disease; wherein he cocainizes the integuments, opens the joint, injects his cocaine solution, and then thoroughly drenches the articulation with a solution of mercuric-chloride or thymol.

Inflammation, he says, is no contra-indication, as it will act equally well then, as at other times, and that the engorged vessels manifest a marked diminution in volume, after its injection. In bone operations we are warned to be certain that the analgesic be deposited within the periosteum, if we would succeed.

Much importance is attached to dosage; small quantities, from ten to twelve centigrammes (from one-third of a grain to two grains) in a one per cent. solution is the maximum for each operation. The operator is directed to use a syringe with a long, very fine needle. The field of operation is to be divided by a quadrangle; along each lateral outline, the needle is to be introduced its whole length. Now, we are directed to do two things simultaneously; and to this, much importance is attached; namely, as we commence to send the piston home, we begin to withdraw the needle, timing both, so that the syringe will be drained before the needle's tip emerges from under the skin.

By sending the needle in four times, in rapid succession, and spraying the tissues, according to the plan directed, we not only paralyze a large district, but we also are free from the accidental injection of a lethal dose into a blood-vessel; for, should the point of the needle enter the lumen of a vessel, as we commence its withdrawal, at the instant that the solution commences to escape, but very little will enter the vessel, and the danger is obviated of injecting considerable quantity into it.

We are told, by the same author, of its priceless value where the patient has a deep-rooted fear of ether or chloroform; when there is a weak heart, kidney disease or bronchitis; when no assistant is at hand, to give the anæsthetic, as with the isolated country practitioner, or when there are no means to compensate an assistant.

After having studied M. Réclus's contribution, which reads more like a romance than a reality, I decided to test the truthfulness and value of his assertions, as soon as I resumed service in the Harlem Hospital, and cases came under my care in which I felt it would be policy to use cocaine hypodermically. It is scarcely necessary to go over in detail each separate case; but I may say that I have used it, in and out of hospital, more than fifty times since, without the slightest accident, or inconvenience, or mishap. There were three herniotomies (two of which were strangulated; one in a woman; all making splendid recoveries); one opening and draining of a hydronephrotic cyst; four fistulas in ano; two pleurotomies for empyema; one suprapubic incision into the bladder; one case of operation for cancer of the lower lip; one urethrotomy; one laparotomy for serous cysts in the broad ligament; one case of gun-shot wound of the thorax, for resection of fragments of shattered ribs; four lithotomies (perineal,

and for enucleation); three of mucoid and lipomatous tumors; with some thirty or more minor operations on ambulant cases.

In my hospital service, the use of general anæsthetics is now practically discarded, except in those cases requiring much time, and in capital amputations.

MANNER OF PREPARING PATIENT AND ADMINISTERING THE COCAINE SOLUTION.

After the part is scrubbed and is rendered thoroughly antiseptic, the patient is placed in a prone position, if possible, the face covered lightly by some light fabric, so as to completely close off the field of operation from vision. This is highly important, for with nervous, sensitive patients, the sight of instruments or the presence of blood will immediately induce syncope.

When I am operating on a limb, I apply the elastic constrictor, according to Dr. Corning's plan, before injecting. In other situations, after I have sprayed the deep tissues, with each injection I seize the underlying parts and knead them with the finger and thumb. In those patients who have very fine, thin, sensitive skins, before I puncture the parts with the hypodermic needle, I douche the surface with a syphon of ice-cold Vichy, which so benumbs the integuments, that the needle is not felt, nor is the cutting edge of the scalpel. I commence to operate almost immediately, after my field for operation has been sprinkled at such depth as may be required.

The rule so far has been, that my patients have lain so quietly, that one seeing me operate, and not seeing the patient's head, would suppose him profoundly anæsthetized; while, as a matter of fact, not a single faculty has been disturbed. From six to twelve centigrammes will so paralyze the reflexes that the effect is positive for fully a half hour or more.

Cocaine analgesia very greatly simplifies an operation. No force or violence is necessary to restrain the patient; and as Réclus well says, one of the most important and useful of all assistants is the patient himself, shifting and moving in any direction required. It reduces the number of assistants fully half, which is an item to an impecunious patient. As a matter of expense, in itself, the cocaine is ten times less expensive than ether. In operating at night, we are not in constant danger of being incinerated, and we can carry enough of the hydrochlorate in our vest-pocket, without inconvenience, to do a dozen operations. It will be observed in surgical operations, which entail cutting, that the culminant action of the drug is interrupted or prevented by the escape of more or less of the solution along the line of the incision.

To attain the best results, the directions of Réclus must be carefully observed, especially with reference to the manner of introducing the needle and circumscribing the zone to be invaded.

DANGEROUS COMPLICATIONS OR SEQUELÆ ATTENDANT ON THE HYPODERMIC USE OF COCAINE.

Many well-known operators have acquired a violent dislike for the hypodermic use of cocaine, because some time in their practice it gave them a fright; hence, their imprecations against it, in any form. They allege that it has given rise to such alarming symptoms, that they have come to regard it as a potent agent for harm; besides, not infrequently when one is able to go through the operation without much resistance, yet they suffer from vertigo and bodily weakness to such an extent as to require several hours rest before they are quite themselves again.

I have investigated many of these allegations, and find that the complaints mainly come from those who

use the drug too timidly or injudiciously. With women, we will surely come to grief unless we exercise great caution; for it has been observed with young girls and hysterical individuals to act with extraordinary energy on the nerve-centres, and may give rise to considerable temporary excitement. Hence, we resort to deception with these cases, for, if we do not, the effects of the imagination will more than counteract the good of the alkaloid. We must assure them that the operation will not be painful, and gain their confidence. If it can be avoided, they should not be permitted to see the instruments or know precisely when the regular steps of the operation are to begin.

The hypodermic injection of the solution may be made a very painful procedure, in itself, in the hands of one awkward or inexperienced; so that the patient determinedly abandons any further manipulation. Accordingly, under these circumstances, it is well to first benumb the integuments with an ether spray, or, what is better, by the douche of a syphon of ice-cold Vichy, before we introduce the needle. We should not inject more than from six to ten centigrammes in a woman, and see to it that every possible provision has been arranged, so that almost at once, and before the drug has been absorbed by the circulation, make the primary incision into the cocainized area; for it acts with nearly instantaneous celerity when injected into the cellular membrane; and, besides, the free incision permits of the draining off, with the blood and secretions, of any redundancy which might accumulate.

With those patients who become boisterous, and go into collapse, I was confident that, in the majority of cases, it comes of fright and painful anticipation; and not from the medicine. Every one knows how keenly alive certain individuals are to mental impressions: in this instance, to the array of instruments, basins,

lotions, dressings, and to the elaborate preparations to forestall hæmorrhage, etc., the very sight of which may, indeed, test the courage of the stoutest. The patient takes the chair in almost a state of syncope. The condition of the patient is not wholly free from contagion, if we are not prepared for it; and hence the operator's hand becomes unsteady. The needle is sent in; to the patient the supreme moment has arrived, and over he goes onto the floor. The rolling eyes and ghastly pallor strike terror into the hearts of the friends; and the "injected poison" (?) comes in, for their fiercest denunciation, when, as a matter of fact, it probably was in no way concerned whatever in the phenomena. Herein, comes an explanation. With cocaine anæsthesia the psychical faculties are intact; hence syncope, fluttering pulse and alarming symptoms. I have observed in every one of my patients who were profoundly sceptical of the powers of the analgesic, that during the momentary interval elapsing between the injection of the solution and the incision, they became deathly pale; their breathing was rapid and shallow; and their pulse nearly uncountable; but after the edge of the scapel entered the deep parts, and they were convinced that no pain was to be borne, those symptoms passed off, as if by magic.

CONCLUSIONS.

In presenting this summary of my experience and my views, I have drawn freely from the invaluable *brochure* of Réclus, to which I had to turn almost exclusively for information as to the use of cocaine in general surgery. I am particularly gratified to be able to verify, in every particular, the fidelity and accuracy of every line in his scholarly and elaborate article.

That cocaine analgesia is one of the greatest boons ever conferred on humanity, is undeniable. There is scarcely a limit to its application; the great difficulty being to understand how it shall be administered, the conditions under which it must be proscribed, and to be on the alert for those indications in operations which warn us of its toxic properties.

How many lives are annually cut short by chloroform and ether! Even though our patients usually react well from general anæsthesia, can any one question but that this saturation of the system with a pungent, volatile liquid, must work havoc with the histological elements of the glands, their secreting and tubular structure? Many times, indeed, the patient has to face two dangers; the anæsthesia and the operation. I have had two patients die, promptly after division of the constriction in strangulated herniæ, under ether anæsthesia. I have cut two others who were in a state of collapse when the cocaine solution was injected; but they both made excellent recoveries. Hence any agent which causes a local benumbing of the parts without compromising the system must be accepted with unfeigned delight and welcome.

We cannot yet assign to cocaine definitely, the position which it should occupy in surgery. Not until it has been more generally employed, and a summary can be drawn up which will cover a great many cases, treated under divers circumstances at different stages of life, is this possible. With a view of hastening this consummation, and recommending the subcutaneous injection of this invaluable alkaloid in general surgery, this rather desultory monograph is offered.

